



## VERMONT

### Introduction and General Description

The fish and wildlife resources in the Lake Champlain basin and the Connecticut River drainage occupy a mosaic of interconnected aquatic and terrestrial habitats. The mineral-rich bedrock and soils of this region support natural communities high in plant and animal diversity. Emergent marshes, bogs and fens, floodplain forests, maple-ash swamps, hardwood-cedar swamps and pine-oak-heath sandplain forests are some of the important natural communities found in the area.

Waterfowl, shorebirds and songbirds use wetlands, woodlands, and riparian areas throughout the region as breeding habitats and for critical stopovers during spring and fall migrations along the Atlantic Flyway. Waterfowl conservation is a focus at Missisquoi National Wildlife Refuge and the Nulhegan Basin Unit of the Conte National Fish and Wildlife Refuge in Vermont.

Restoration of fish populations, including landlocked Atlantic salmon is a focus for the U.S. Fish and Wildlife Service and its cooperators in the Lake Champlain Basin. In the Connecticut River, Atlantic salmon restoration is a multi-state initiative spearheaded by the Connecticut River Atlantic Salmon Commission.



**Landlocked salmon from Lake Champlain.**

In order to provide benefits to Federal trust resources the Partners for Fish and Wildlife Program has emphasized the following initiatives:

- i Riparian Fencing
- i Riparian Revegetation
- i In-stream Fisheries Restoration
- i Wetland Restoration
- i Invasive Species Control
- i Natural Community Restoration
- i Fish Passage/Dam Removal
- i Grassland Management
- i Early Successional Habitat Management

### Threats

Fortunately, the region is a place where people continue to benefit from relatively healthy natural communities. However, the effects of three centuries of European settlement have had severe adverse consequences on local ecosystems. The Vermont Agency of Natural Resources has

estimated that over 35 percent of Vermont's wetlands have been lost and that 1200 river miles do not fully support designated uses or are not in compliance with water quality standards. About 2000 dams exist in Vermont that have had significant long term impacts on fish passage and water quality.

Agricultural, transportation and residential development continue to adversely affect Federal trust fish and wildlife resources dependent on good water quality and available habitat. Of particular note, in the Lake Champlain Basin, phosphorus loading in the lake has increased four-fold over the original pre-development levels. Human-caused impacts result in excessive bank erosion and siltation, loss of natural communities, incremental loss of wetlands, and excessive nutrient inputs, higher than normal summer water temperatures, and low oxygen conditions in some river systems.



**Severe riverbank and channel instability on the Trout River.**

Relatively recent introductions of invasive plants, e.g. purple loosestrife, water chestnut, have caused significant impairment to wetlands and other natural communities.



**Wetland infested with purple loosestrife.**

Dams and other barriers to fish passage continue to adversely affect fish populations. Based on historical records, salmon (up to 20 pounds) walleye, and lake sturgeon were once caught in abundance in Lake Champlain and sea-run Atlantic salmon were common in the Connecticut River system. While a significant open-water fishery for salmon has since been established in Lake Champlain, sea-run salmon have been slow to return in significant numbers to the Connecticut River watershed. In both cases, full restoration is still only a goal.

## **Species and Habitats of Special Concern**

The Lake Champlain Basin and eastern Vermont include some of the highest quality wetland habitats in the northeastern United States. In addition, the streams and riparian habitats in this region provide key habitat for a number of Federal trust species and a

significant number of rare plant and animal species.

Thirteen bird species in the Lake Champlain Basin are listed by New York, Vermont and/or the Federal government as endangered or threatened, including bald eagle and peregrine falcon. One mammal species, the Indiana bat, is federally listed as endangered. Seven fish species found in the Lake Champlain Basin are classified by Vermont or New York as endangered or threatened, including lake sturgeon, American brook lamprey and mooneye. The highest native freshwater mussel diversity in New England occurs in the Lake Champlain watershed with nine of the species being State-listed. Populations of the dwarf wedge mussel, a federally-listed endangered species occur in the Connecticut River.



**Several freshwater mussel species from Lake Champlain.**

## **Conservation Strategies**

The Service works to restore riparian, in-stream and wetland habitats focusing on benefits to multiple migratory fish and wildlife species. Partnerships with others is a primary emphasis of the Partners Program. Combining the goals of private landowners and other conservation partners with those of the Service has allowed

the Partners Program to leverage the value of Service funds at better than a 2:1 ratio.

### ***Riparian Habitat***

Livestock fencing, streambank stabilization (using bioengineering techniques), and streambank revegetation are techniques used to restore riparian habitat in partnership with others. Agricultural land clearing and loss of streamside forests have had a detrimental impact on water quality. Loss of forested riparian areas eliminate habitat for wildlife that depend on these areas for breeding and as dispersal corridors. Livestock fencing at \$1-2 per foot is often combined with tree and shrub planting at \$500-\$1000 per acre.



**Fencing to exclude livestock from Huntington River.**

### ***In-stream Habitat***

The Partners Program works comprehensively on in-stream fisheries restoration projects using multiple techniques. Examples include: installation of large woody material for in-stream cover and bank stability and the restoration of proper pool/riffle ratios using a geomorphic

approach to river channel restoration. These techniques are used to reduce the oversupply of fine sediment that enters the river and degrades in-stream habitat. River restoration projects are combined with riparian revegetation practices to secure multiple benefits to fish and wildlife. River channel and fisheries habitat restoration projects have been completed at a cost of \$15-\$25 per foot.



**Constructed cross vane and pool with large woody material on the White River.**

### ***Wetlands***

Practices used to restore degraded wetlands include blocking old drainage ditches with low-level berms and the restoration of original wetland micro-topography that has often been lost due to past agricultural drainage and land-leveling practices. Completed projects often result in a mosaic of permanent and seasonal wetlands



**Drained wetland before restoration.**

providing habitat for numerous



**Restored wetland after 5 years.**

wetland dependent species. Wetlands are restored at a cost of \$700-\$1000 per acre.

### ***Invasive Species***

Wetland and upland habitats of the Lake Champlain and Connecticut River valleys have been adversely affected by the introduction of several non-native species. Two plant species, purple loosestrife and water chestnut, invade wetland areas and out compete native plants often resulting in monotypic stands with adverse consequences to native fish and wildlife.



**Hand-pulling water chestnut.**

Working with the VT Department of Environmental Conservation, the Partners Program has assisted with the propagation and release of insects that feed exclusively on purple loosestrife which has resulted in significant reductions of loosestrife abundance in targeted wetlands. In partnership with The Nature Conservancy, the Partners Program has assisted with efforts

to remove water chestnut infestations from the Lake Champlain wetlands of New York and Vermont. This occurs through the arduous task of hand-pulling the plants before they set seed. With assistance of many dedicated volunteers, water chestnut has been significantly reduced in many areas. Costs for invasive species control projects range from \$100-\$500 per acre.

### ***Natural Communities***

Working with The Nature Conservancy, Vermont Biodiversity Project, VT Association of Conservation Districts, and the Intervale Foundation, the Partners Program has initiated a native tree and shrub nursery to restore rare and declining natural communities. Initial emphasis will be placed on floodplain forest and riparian habitats in the Poultney River and Otter Creek watersheds and the Clay Plain forests throughout the Lake Champlain watershed. These communities have undergone extensive change because of historical land clearing, but targeted areas have been identified for restoration through tree and shrub replanting. Costs for this effort will range from \$1000 to \$2000 per acre.

### ***Fish Passage/Dam Removal -***

Working in partnership with the interagency Vermont Dam Evaluation Team, the Partners Program is assessing and evaluating dams for removal in the White and Lamoille River drainages. Dam removal combined with in-stream habitat restoration will restore access to



historical spawning areas and allow for needed seasonal migration of fish to upstream and downstream areas. Several projects are in the design and fund-raising stage. Expected costs for each of these projects range from \$50,000 to \$250,000.



**Candidate for dam removal - Jackson Dam on Lamoille River.**

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The Nature Conservancy  
Trout Unlimited  
Ducks Unlimited  
FishAmerica Foundation  
Vermont Land Trust  
Vermont Youth Conservation Corps  
Missisquoi River Basin Association  
White River Partnership  
Lewis Creek Association  
Battenkill Watershed Alliance  
Friends of the Mad River  
Poultney-Mettowee Watershed Partnership  
Friends of the Winooski River  
Lamoille River Anglers Association  
Green Mountain Fly Tiers  
Ben and Jerry's Inc.  
Orvis Company Inc.  
Municipalities of Granville, Montgomery, Hinesburg,  
Waterbury, South Royalton, Starksboro, Duxbury,  
Underhill, and Stowe

### *cessional Habitats*

By providing technical assistance to U. S. Department of Agriculture staff, primarily in the Champlain valley, the Partners Program has enhanced grassland and early successional forest habitats using late season brush-hogging and mowing. Both habitats have declined greatly in northern New England as farmland has reverted to forest causing significant declines in migratory bird species dependant of those habitat types.

## **Partners**

Natural Resources Conservation Service  
Farm Services Agency  
Vermont Association of Conservation Districts  
14 Natural Resources Conservation Districts  
Green Mountain National Forest  
Vermont Department of Fish and Wildlife  
Vermont Department of Environmental Conservation  
Vermont Agency of Transportation  
New York Department of Environmental  
Conservation  
Environmental Protection Agency  
National Marine Fisheries Service  
Federal Emergency Management Agency  
Lake Champlain Basin Program  
Connecticut River Joint Commission

## **Accomplishments**

Since 1991, the Partners Program in Vermont has completed:

- i Over 280 projects with about 300 different landowners
- i 102 miles of riparian restoration
- i 935 acres of wetland restoration
- i 5.2 miles of in-stream restoration
- i 635 acres of upland restoration
- i 12 miles of stream reopened to fish passage
- i 900 acres of habitats impacted by invasive species

### **Highlights**

During fiscal years 2000 and 2001, the Service cooperated on the largest river restoration project completed to date in New England. A 9000-foot reach of the Trout River in Vermont was restored using a geomorphic approach to channel design and soil bioengineering techniques. The completed project restored riparian wetlands, reduced severe bank erosion, returned a braided stream system to a single channel system, narrowed an over-widened

channel, introduced large woody material, and restored pool and riffle habitat. The local community came together to plant over 100,000 native willows and 2400 trees and shrubs encompassing over 20 acres of riparian habitat. The project has been used as a demonstration project for a number of agencies and organizations throughout New England.



**Completed rootwad log vane and tree revetments on the Trout River.**

In partnership with the Green Mountain National Forest, the State of Vermont and the community-led White River Partnership, the Partners Program completed approximately a dozen projects in the White River of the Connecticut River watershed. These projects have restored fisheries habitat, especially that of Atlantic salmon, through introduction of woody cover, planting vegetation to increase shading and bank stabilization to reduce soil erosion and substrate embeddedness.

## **Future Needs**

- i** Restore and protect 1000 in-stream river miles using techniques that address bank erosion and provide the necessary pools and riffles to restore native fisheries habitat and increase the recreational value of rivers to local communities.
- i** Restore and protect 5,000 miles of riparian habitats to provide critical areas for migrating songbirds and buffer areas necessary for healthy river systems.

- i** Assist interagency efforts to reduce annual phosphorus loads to Lake Champlain by 57 metric tons using stream and riparian restoration projects.
- i** Restore or enhance 1000 acres of wetlands, primarily in the Lake Champlain watershed, to provide benefits to migratory waterfowl and other wetland birds.
- i** After evaluation, remove 50 dams or other barriers to fish passage to benefit native Lake Champlain and Connecticut River fish species.
- i** Integrate 1000 acres of rare natural community restoration into the working agricultural landscape with emphasis on floodplain forests, hardwood swamps, and clay plain forests.
- i** Treat and restore 4000 acres of wetland and upland habitats degraded by invasive non-native species.
- i** Work in the Battenkill River watershed of Vermont and New York to restore fisheries habitat to this world renowned trout fishing river. During the last decade, sportfish populations have plummeted and their recovery will be assisted through cooperative in-stream habitat restoration efforts.

## **CONTACT**



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